DOCUMENT RESUME

ED 273 794 CE 044 986

AUTHOR Navaratnam, Kathiravelu K.
TITLE A Cost-Benefit Analysis Model for Secondary Vocational Programs: A New Approach from School Perspective.
PUB DATE [86]
NOTE 22p.
PUB TYPE Reports - Research/Technical (143)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *Cost Effectiveness; Economic Factors; Economic Research; *Educational Economics; Financial Support; Income; *Models; *Outcomes of Education; *Program Costs; Program Implementation; Secondary Education; *Vocational Education

ABSTRACT

This study established a cost-benefit analysis model for use by local school practitioners to assist in efforts to determine the economic outcomes of their vocational education programs. The model, the components of which were costs, process, and benefits, was established with the assistance of a panel of experts that included a local school administrator. Once established, the model was implemented within a local school division using programs from four different vocational service areas. The costs were determined by using school records for the previous year and prorated according to use by vocational education. Components of costs were personnel, building, equipment, materials and supplies, administration, travel, services, utilities, and maintenance. The process was the actual conduct of the programs. The benefits were determined by the income from graduates' salary, income earned from cooperative placement of students, and income from the provision of services by the program to the public. The findings from use of the model indicate that three of the four vocational programs had positive economic outcomes. The panel of experts determined that the model was both usable and transportable. The researchers recommended the use of the model to assist local school practitioners in determining economic outcomes and making decisions based upon such outcomes in vocational education. (Author)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED273794

A COST-BENEFIT ANALYSIS MODEL FOR SECONDARY VOCATIONAL PROGRAMS: A NEW APPROACH FROM SCHOOL PERSPECTIVE

K. K. Navaratnam, Ed.D
Center for Volunteer Development
Virginia Tech Cooperative Extension Service
Blacksburg, Va 24061
(703) 961-7966 or 951-2692

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

K K Navaratnam

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

CE044286

ABSTRACT

A COST-BENEFIT ANALYSIS MODEL FOR SECONDARY VOCATIONAL PROGRAMS: A NEW APPROACH FROM SCHOOL PERSPECTIVE

This study notes the increasing need for economic justification of vocational education at the local level. As an economically based activity, each vocational education program must be able to demonstrate its utility. With the new federalism program of proposed reduced financial support for vocational education, the close scrutiny of programs has never been needed more.

This study established a cost-benefit analysis model for use by local school practitioners to assist in efforts to determine the economic outcomes of their vocational education programs. The model, which consisted of costs, process, and benefits as its components, was established with the assistance of a panel of experts which included a local school administrator. Once established the model was implemented within a local school division using programs from four different vocational service areas.

The costs were determined by using school records for the previous year and prorated according to use by vocational education. Components of costs were personnel, building, equipment, materials and supplies, administration, travel, services, utilities, and maintenance. The process was the actual conduct of the programs. The benefits were determined by the income from graduates' salary, income earned

from cooperative placement of students, and income from the provision of services by the program to the public.

The findings from use of the model indicate that three of the four vocational programs had positive economic outcomes. The panel of experts determined that the model was both useable and transportable. The researchers recommend the use of the model to assist local school practitioners in the determination of economic outcomes and in assistance with making decisions based upon such outcomes in vocational education.

A COST-BENEFIT ANALYSIS MODEL FOR SECONDARY VOCATIONAL PROGRAMS: A NEW APPROACH FROM SCHOOL PERSPECTIVE

The Vocational Education Act of 1963 and its amendments have lead vocational administrators, public officials, and economists to estimate benefits of vocational education programs. Consequently, vocational administrators have become more responsible not only to raise the dollars but also to justify those dollars in achieved economic and noneconomic benefits and costs in vocational education programs (Wylie, 1983). An assessment of costs and benefits of secondary vocational program is crucial especially under the present funding system for the vocational education in this country. An important and useful procedure for examining costs and benefits of vocational education is cost-benefit analysis. Cost-benefit analysis is a monetary tool by which resulting monetary benefits from inputs use are determined (Irvin, 1980). Thus, this study was designed to develop and use a cost-benefit analysis model which estimate the economic outcomes of secondary vocational education programs from the school view (Navaratnam, 1985).

Need for a New Approach

Federal support for vocational education has begun to decline (Hartle & Rosenfeld, 1984), and the economic forecast towards the 21st century appears to be a threat to vocational education, especially with the Gramm-Rudman law of "balance the budget by 1991." Vocational education in many states and localities is already under fiscal pressures and looking for programs they can cut in an effort to reduce expenses and increase the effectiveness of resources utilization. Thus, a major challenge confronting vocational education in this country is to justify its programs in economic terms (Milbergs, 1981). In fact, local school boards are interested in the economic impacts of vocational education in their communities rather than descriptive reporting on inputs, staff activities, and participant's information (Howell & Frankel, 1983).

The traditional method of evaluating vocational education, establishing relationship between dollars and inputs, is an inadequate and incomplete measure of economic benefits of vocational education programs (Warmbrod, 1977). In the light of the above concern, there is a need to relate inputs and outputs in terms of dollars. Some cost-benefit studies of vocational education have been conducted by economists or educators with major help from economists (Bruce, 1967; Ghazalah, 1975; Hu, Lee, & Stromsdorfer, 1971; & Kim, 1980). Such studies were generally large scale attempts and mostly conducted for policy making at higher levels. No studies could be identified which were conducted only from the school's point of view and at the single program level within a service area. Thus, there is an absence of a practical evaluation model which considers both costs and benefits to

estimate the economic outcomes of secondary vocational education programs from the school's point of view.

Objectives of the Study

The purpose of this study was to develop and field test a cost-benefit analysis model to estimate the economic benefits of secondary vocational programs from the school's point of view. Specifically, the objectives of this study were to:

1. Develop a cost-benefit analysis model to estimate the economic benefits of secondary vocational education.
2. Field test the model.
3. Gather feedback information on transportability of the model based on the field testing.
4. Make recommendations on the use of the model for secondary vocational education.

Methodology

The methodology for developing and field testing the cost-benefit analysis model of secondary vocational education consisted of the following procedures:

1. Develop a cost-benefit analysis model for a secondary vocational education program.
2. Seek the opinion of a panel of experts relating to needed revision in the cost-benefit analysis model.
3. Field test the revised model to determine its feasibility.

4. Determine the useability and transportability of the model to other secondary vocational education settings.

The Model

Ghazalah and Pejovich (1973) pointed out that cost-benefit analysis must develop a model because without such a model, it would be difficult to evaluate vocational education programs in terms of costs and benefits. The proposed model consisted of inputs, processes, and outcomes. The cost component of the model included items such as instructional personnel, buildings, equipment, materials and supplies, administration, travel, utilities, maintenance, and services. The benefits component consisted of economic earnings such as increased earnings from graduates' employment, earnings from cooperative placement, and earnings from provision of services.

Panel of experts' opinions and suggestions were used to refine and revise the cost-benefit analysis model. The panel of experts consisted of four members including a local vocational administrator, a teacher educator, an economist, and a state advisory council executive director. Members of the panel of experts were purposively selected. The panel of experts was given a brief outline of the model and the calculation procedures for their opinion and suggestions. Opinion and suggestions rendered by the experts were used to revise and refine the model. Figure 1 shows the conceptual framework of the proposed model.

---

place figure 1 about here

Field Testing the Model

The revised cost-benefit analysis model was used for field testing. A comprehensive high school and an area vocational center were purposively selected for this study in the Roanoke County School Division, Virginia. The business education and marketing and distributive education programs from a comprehensive high school, and occupational home economics and trade and industrial programs from an area vocational center were purposively selected with the help of the vocational director for the school division and teachers for those programs. All four programs had cooperatively placed students. The criteria used for selecting the programs for the field testing model were to have:

1. Compatible and similar objectives among various program areas in vocational education.
2. Teacher willing to participate in the study.
3. As many vocational services areas represented as possible within the financial constraints of the study.
4. Programs to be conducted in both a comprehensive high school and a vocational education center.

Data Collection

A graduate follow-up questionnaire used by the Roanoke County School Division was modified and used for the follow-up survey. A review of the questionnaire by principals, teachers, and other administrators indicated that graduates should be able to understand and complete the questions. This study was conducted under the

assumption that a valid instrument was also a reliable instrument (Borg & Gall, 1984). Thus, content validity and reliability of the questionnaire were confirmed. A follow-up survey was conducted to determine the monthly income earned, average number of hours worked per week, and noneconomic benefits obtained by the graduates in each program. Because all 46 graduates in the four programs were considered for the study, sampling was not used. There was a 73.9% return from the survey. Further, researcher made multiple visits to the division's central administrative office, comprehensive high school, and the area vocational center to collect costs, benefits, and anecdotal data needed for testing the model in the field.

Calculation of Costs

Vocational education programs are considerably more expensive than general academic education (Hu et al., 1971). Therefore, it is important that the calculation of costs includes all the component of the costs of a particular vocational education program. Considering the above fact, "ingredient approach" (Levin, 1975) was used to classify the costs in vocational education programs. The ingredient approach focuses on listing all inputs required by a vocational program and assessing their costs only after all of the inputs have been accounted for.

The cost of instructional personnel was prorated based on the percentage of instructional time spent in the specific program. The annual cost of the building space used for the program was prorated based on the current replacement square footage cost of $50.00 for

school buildings in Virginia with an anticipated life expectancy of 50 years. Current value of equipment owned for each program was used to prorate the equipment cost. A lifespan of 5 to 20 years was selected, depending upon the size and cost of the equipment to calculate its annual costs. Accordingly, larger and more expensive pieces of equipment usually have a longer lifespan and the smaller and less expensive pieces of equipment have a shorter lifespan. Costs incurred in the 1983/84 fiscal year for materials and supplies and travel were considered as 100% vocational costs in the model. Administration, utilities, services, and maintenance costs of fiscal year 1983/84 were prorated for each program by using the proportion of students enrolled in a program compared to the total enrollment in the respective school. The total cost was not discounted because all the program costs were considered to have occurred in one year.

Calculation of Benefits

The benefits in vocational education include both economic and noneconomic outcomes accrued as a result of the vocational education program (Haveman & Wolfe, 1984). Accordingly, following benefits were considered in this study:

1. Increased income from graduates' employment.
2. Income from provision of services.
3. Income gained from cooperative placement of students.
4. Noneconomic benefits such as increased knowledge, high job satisfaction, care of child, and sense of well being.

Increased income from graduates' employment was determined by subtracting the Federal minimum hourly wage of $3.35 from the graduates' hourly earnings and multiplying by the average number of hours worked during the first year of their employment. Based on the first year earning, present value of annual increased income for the second through fifth years was determined after adjusting for 3% annual salary increases. Income earned from cooperative placement and provision of services were added to the first year income. The benefits of the second through fifth years valued in monetary terms were summed and discounted to the present value by a discount factor determined on the basis of 6.5% interest rate. Because vocational education uses public dollars to fund its programs, an average of both the state literary fund loan interest rate (4%) and the current money market saving account average interest rate (9%), was used to determine the 6.5% interest rate used in discounting the benefits.

The noneconomic benefits identified by the researcher through literature review and accepted by the Roanoke County School Division vocational advisory council as important to the total outcome of benefits received from vocational education programs included increased knowledge, high job satisfaction, improved public speaking ability, care of child, improved communication ability, greater job opportunities, positive work attitude, better citizenship, ability to make better decision, influence on family size, and greater sense of well being. The students' responses on percentage of obtained noneconomic benefits were determined in the calculation. However, the noneconomic benefits of the selected programs were not converted to an economic basis

because it is impossible to value them in monetary terms (Kim, 1980; Levin, 1975).

Findings

Trade and industrial (T&I), business education (BUS), and marketing and distributive education (MD) programs all obtained greater economic benefits than costs. However, the occupational home economics (OHE) program showed greater costs than economic benefits. Table 1 shows the total costs for 1983/84 of all four programs.

Place table 1 about here

Table 2 shows the present value of net profit that could be obtained from each of the four programs for five consecutive years. The relative benefits have exceeded the relative costs in three programs of this study.

Place table 2 about here

Table 3 shows some of the noneconomic benefits obtained by the respondents in each program of this study.

---

place table 3 about here

Useability and Transportability

Useability is considered the extent to which the cost-benefit analysis model is a practical enough to be used by vocational administrators at the secondary level. Transportability is the extent to which the cost-benefit analysis model is feasible for use in secondary vocational education settings other than where it is field tested. The panel of experts opinion were used to determine both useability and transportability of the model. Members of the panel of experts were contacted twice to help them evaluate the model. At the first instant, an outline of the model was shared and at the second time, findings of the study were shared.

The panel of experts was of the opinion that the model could be used by vocational education administrators to show the local community the relative benefits of the program compared to its costs through a relatively simple accountability and reporting system. Further, the panel of experts suggested that the model may be a start in the direction of greater accountability, and it could be an effective decision making tool in vocational education program at the secondary level.

Conclusions

The findings of this study show a new direction in the application of the concept of cost-benefit analysis as an evaluation technique in estimating the economic benefits of secondary vocational education programs. Vocational administrators and other decision makers can use this practical model to facilitate determining the economic justification of vocational education programs.

From the specific field testing of the model in this study it was concluded that:

1. The trade and industry, business education, and marketing and distributive education programs were economically profitable.
2. The occupational home economics program was not economically profitable.
3. The graduates in each program obtained several noneconomic benefits.
4. The proposed cost-benefit analysis model is both useable and transportable.

Discussion

The implementation of the cost-benefit analysis model of secondary vocational education programs with its findings and conclusions suggest that the Roanoke County model can be used to estimate the economic outcomes of local programs and is transportable to other secondary vocational education settings. The Roanoke County model has helped to determine the economic gain or loss of programs and eventually to differentiate the profitable and nonprofitable programs from the point of view of the school. Accordingly, the researcher concludes that the proposed model has accomplished what it was intended to do. Special efforts were made by the researcher to make the model as pragmatic as possible. For example, the present value of graduates' income was determined by multiplying a percentage factor for anticipated raises and discounts from the reported first year income. Instead of surveying control group of graduates, the Federal minimum wage was used to determine the increased income.

The success in using this model at the secondary level has led the researcher to recommend that the model be used to determine the economic outcomes of vocational education programs in other settings from school point of view. Because there are variations in the process of implementing vocational programs from one setting to another, the specific proration and calculation procedures used in this study may or may not be directly applicable to other vocational education settings. However, the researcher believes that the basis on which the costs and benefits were prorated could be a useful guide in the future for using this model as a simple evaluation procedure in vocational education.

The low employment rates, lack of opportunities to earn income during cooperative placement, and a tendency not to be economically employed were the reasons for nonprofitability of the occupational home economics program. Therefore, local administrators must be cognizant of all related factors while using this cost-benefit analysis model for their school system. While it is difficult to please all potential users with a single model, this one contains both sufficient guidance and flexibility to be used in any school setting. Local school practitioners who possess a calculator and the data which is available in most school divisions' central offices can use this model to estimate the economic benefits of vocational education programs. Such an estimate can be extremely useful in the local school decision making process. Thus , this newly developed cost-benefit model be a useful tool in achieving a credible accountability and reporting system in secondary vocational education from the school perspective.

BIBLIOGRAPHY

Borg, W.R., & Gall, M.D.(1983). *Educational research: An introduction*. New York: Longman, Inc.

Bruce, F.D.(1967). Benefit cost analysis of vocational education: A survey. In A.Kotz(Ed.) *Occupational education: Planning and programming*. Stanford, CA: Stanford Research Institute.

Ghazalah, I.A.(1975). *The occupational work adjustment and occupational work experience program in Ohio: A cost-benefit study*. Columbus: The Ohio Advisory Council.

Ghazalah, I.A., & Pejovich, S.(1973). The economics of vocational and technical education: A report on three studies. *Review of Social Economy, 31*(2), 191-198.

Gittinger, P.P.(1982). *Economic analysis of agricultural projects*. Baltimore, MD: The Johns Hopkins University Press.

Hartle, T.W., & Rosenfeld, S.(1984). The federal presence in vocational education-beyond the VEA. *VocEd, 59*(1), 24-26.

Haveman, R.H., & Wolfe, B.L.(1984). Schooling and economic well being: The role of nonmarket effects. *Journal of Human Resources, 19*(3), 377-407.

Howell, J.M., & Frankel, L.D.(1983). Requisites for collaboration: The view from financial community. In American Vocational Association(Ed.), *Collaboration: Vocational education and the private sector* (pp. 55-63). Arlington, VA: American Vocational Association.

Hu, T., Lee, M., & Stromsdorfer, E.W.(1971). Economic returns to vocational and comprehensive high school graduates. *Journal of Human Resources, 6*(1), 25-50.

Irvin, G.(1980). *Modern cost-benefit methods: An introduction to financial, economic and social appraisal of development project*. New York: The Macmillan Press Ltd.

Kim, J.E.(1980). Cost-effectiveness/benefit analysis of post-secondary occupational program: A conceptual frame work. *Planning & changing, 11*(3), 150-165.

Levin, H.M.(1975). Cost-effectiveness analysis in evaluation research. In M.Guffentag & E.L. Struening(Eds.), *Handbook of evaluation research: Vol.2*(pp. 89-122). Beverly Hills, CA: Sage Publications.

Milbergs, E.(1981). Options for the 1980s: Changing life styles, economy, and information. In K.B. Greenwood(Ed.), *Contemporary challenges for vocational education*(pp.3-5). Arlington, VA: American Vocational Association.

Navaratnam, K. K. (1985). *Cost-benefit analysis of secondary vocational education programs*. Unpublished dissertation, Virginia Polytechnic Institute and State University, Blacksburg.

SPSS Inc. (1983). *SPSSx*. New York: McGraw Hill Book Co.

Warmbrod, J.R.(1977). Cost-benefit analysis and cost-effectiveness analysis in education and vocational education. In W.G. Meyer(Ed.), *Vocational education and the nation's economy*(pp. 139-152). Washington, DC: American Vocational Association.

Wylie, E. W.(1983). Cost-benefit analysis of a school health education program: One model. *Journal of School Health, 53*(6), 371-373.

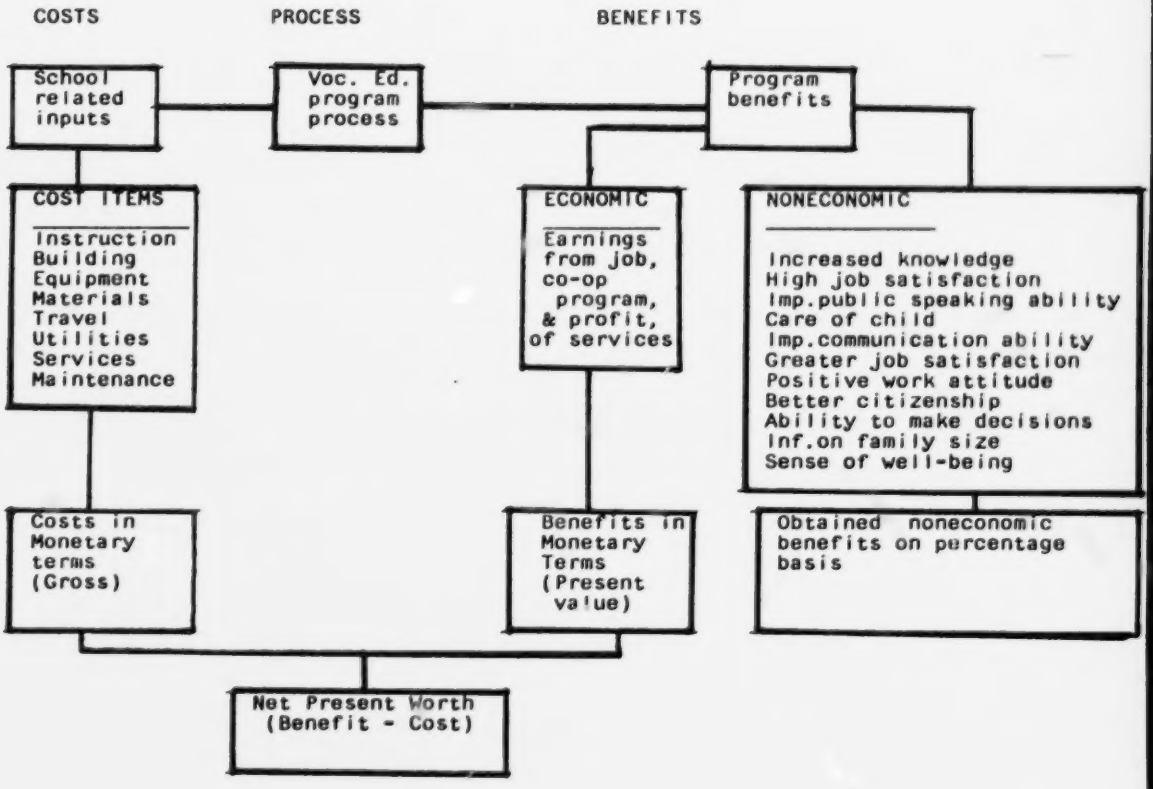

Figure 1: Cost-benefit Analysis Model of a Vocational Education Program

Table 1
Summary Costs of Four Vocational Programs For 1983/84

Cost components	Annual costs T & I (n=12)	OHE (n=7)	BUS (n=10)	MD (n=17)
Ins.personnel cost	$29314	$25588	$17213	$12645
Building	2583	1852	1200	650
Equipment				
Large	2886	346	-	-
Medium	1281	253	43	93
Small	300	93	256	24
Matl. & supplies				
Textbooks	331	500	52	460
Consumable	1194	47	470	1273
Administration				
Principal	1981	1156	903	1536
Secretaries	1285	750	525	893
Counselor	1255	732	274	467
Voc. admin	466	272	113	192
Custodial	723	421	740	1259
Teacher support	1141	666	516	878
Fringe benefits	1819	1048	762	1296
Sch. audit	13	8	6	11
Travel	1624	1464	277	607
services	1146	668	981	1667
Utilities				
Electricity	499	291	585	995
Water	19	11	27	46
Telephone	132	77	38	64
Sewer	30	17	29	50
Gas	844	492	306	520
Fuel	346	202	-	-
Maintenance				
Cus.supplies	42	24	45	78
Other	55	32	35	60
Total cost for prm.	51322	37019	25407	25773
Cost per student	4276	5288	2540	1516

Note. Total costs were determined based on the students enrolled in each program.

Table 2
Present Value of Net Profit of Four Vocational Programs Based on Employed Graduates

Prm	Yr	Pre. value of benefits	Total costs	Net Profit (program)
T	1	72218	51322	20896
&	2	94169	51322	42847
I	3	115495	51322	64173
(n=10)	4	136137	51322	84815
	5	156035	51322	104713
O	1	7667	37019	(29352)
H	2	10310	37019	(26709)
E	3	12878	37019	(24141)
(n=2)	4	15363	37019	(21656)
	5	17759	37019	(19260)
B	1	57114	25407	31707
U	2	71650	25407	46243
S	3	85771	25407	60364
(n=9)	4	99440	25407	74033
	5	112616	25407	87209
M	1	73753	25773	47980
D	2	87538	25773	61765
(n=14)	3	100931	25773	75158
	4	113894	25773	88121
	5	126390	25773	100617

Note. Present value of benefits were calculated based on the number of graduates employed among the respondents, but not on the basis of the enrolled students in each program.

Table 3
Percentage Who Obtained Noneconomic Benefits of Four Vocational Programs

Noneconomic benefits	T & I (n=10)	OHE (n=5)	BUS (n=9)	MD (n=10)
Inc. knowledge	90	40	87.5	100
Hig.job satisfaction	20	60	62.5	50
Imp.pub.speaking	00	00	50.0	40
Care of child	00	60	00.0	00
Imp comm.ability	10	40	62.5	80
Greater job oppot.	80	20	75.0	70
Pos.work attitude	60	60	75.0	90
Bett.citizenship	30	40	25.0	40
Better ability	70	40	50.0	50
Inf.on family size	00	40	00.0	00
Sense of well being	50	60	50.0	70